

WHAT IS CLAIMED IS:

1. A method for registering corresponding intensity images comprising:
 - 5 providing a first intensity image;
 - providing a second corresponding intensity image;
 - separately performing an edge enhancement operation on the first intensity image and the second intensity image;
 - 10 separately performing a noise removal thresholding operation on the first intensity image and the second intensity image;
 - separately transforming the first intensity image and the second intensity image using a Fourier transform;
 - 15 computing a coherence function using first intensity image and the second intensity image;
 - transforming the coherence function using an inverse Fourier transform;
 - performing a magnitude operation on the transformed coherence function;
 - 20 calculating a confidence value based on the magnitude operation; and
 - determining the acceptability of the correspondence between the first intensity image and the registration using the computed confidence value.
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2. The method of Claim 1 further comprising providing the first intensity image and the second intensity image using a digital holographic imaging system.
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3. The method of Claim 1 wherein calculating the confidence value utilizes at least one identified coherent peak.

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4. The method of Claim 1 wherein calculating the confidence value further comprises determining the difference in strength between a first coherent peak and a second peak.

5. A method for registering holographic images
comprising:

providing a first holographic image and a second
corresponding holographic image;

5 separately transforming the first holographic image
and the second holographic image using a Fourier
transform;

separately performing a sideband extraction
operation on the resulting first holographic image and
10 the second holographic image;

separately filtering the resulting the first
holographic image and the second holographic image using
a bandpass filter;

separately transforming the resulting first
15 holographic image and the second holographic image using
an inverse Fourier transform;

separately performing a magnitude operation on the
resulting first holographic image and the second
holographic image;

20 separately performing a noise removal thresholding
on the resulting first holographic image and the second
holographic image;

separately transforming the resulting first
holographic image and the second holographic image using
25 a Fourier transform;

calculating a coherence function of the resulting
first holographic image and the second holographic image;

transforming the coherence function using an inverse
Fourier transform;

performing a magnitude operation on the resulting transformed coherence function;

calculating a confidence value based on the magnitude operation; and

5 determining the acceptability of the correspondence between the first holographic image and the second holographic image based upon the confidence value.

6. The method of Claim 5 further comprising
10 providing the first holographic image and the second holographic image using a digital holographic imaging system.

7. The method of Claim 5 wherein calculating the
15 confidence value utilizes at least one identified coherent peak.

8. The method of Claim 5 wherein calculating the confidence value further comprises determining the
20 difference in strength between a first coherent peak and a second peak.

9. A method for registering holographic images
comprising:

providing a first holographic image and a second
corresponding holographic image;

5 separately transforming the first holographic image
and the second holographic image using a Fourier
transform;

separately performing a sideband extraction
operation on the resulting first holographic image and
10 the second holographic image;

separately filtering the resulting the first
holographic image and the second holographic image using
a low pass filter;

separately transforming the resulting first
15 holographic image and the second holographic image using
an inverse Fourier transform;

separately performing a phase operation on the
resulting first holographic image and the second
holographic image;

20 separately performing a phase-aware edge enhancement
operation on the resulting first holographic image and
the second holographic image;

separately performing a noise removal thresholding
on the resulting first holographic image and the second
25 holographic image;

separately transforming the resulting first
holographic image and the second holographic image using
a Fourier transform;

calculating a coherence function of the resulting
30 first holographic image and the second holographic image;

transforming the coherence function using an inverse
Fourier transform;

performing a magnitude operation on the resulting
transformed coherence function;

5 calculating a confidence value based on the
magnitude operation; and

determining the acceptability of the correspondence
between the first holographic image and the second
holographic image based upon the confidence value.

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10. The method of Claim 9 further comprising
providing the first holographic image and the second
holographic image using a digital holographic imaging
system.

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11. The method of Claim 9 wherein calculating the
confidence value utilizes at least one identified
coherent peak.

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12. The method of Claim 9 wherein calculating the
confidence value further comprises determining the
difference in strength between a first coherent peak and
a second peak.

13. A method for registering holographic images comprising:

providing a first holographic image and a second corresponding holographic image;

5 separately transforming the first holographic image and the second holographic image using a Fourier transform;

separately performing a sideband extraction operation on the resulting first holographic image and
10 the second holographic image;

separately filtering the resulting the first holographic image and the second holographic image using a bandpass filter;

calculating a coherence function of the resulting
15 first holographic image and the second holographic image;
transforming the coherence function using an inverse Fourier transform;

performing a magnitude operation on the resulting transformed coherence function;

20 calculating a confidence value based on the magnitude operation; and

determining the acceptability of the correspondence between the first holographic image and the second holographic image based upon the confidence value.

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14. The method of Claim 13 further comprising providing the first holographic image and the second holographic image using a digital holographic imaging system.

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15. The method of Claim 13 wherein calculating the confidence value utilizes at least one identified coherent peak.

- 5 16. The method of Claim 13 wherein calculating the confidence value further comprises determining the difference in strength between a first coherent peak and a second peak.

17. A method for registering holographic images comprising:

providing a first holographic image and a second corresponding holographic image;

5 separately transforming the first holographic image and the second holographic image using a Fourier transform;

separately performing a sideband extraction operation on the resulting first holographic image and
10 the second holographic image;

separately filtering the resulting the first holographic image and the second holographic image using a bandpass filter;

calculating the conjugate product of the resulting
15 first holographic image and the second holographic image;

transforming the conjugate product using an inverse Fourier transform;

performing a magnitude operation on the resulting transformed conjugate product;

20 calculating a confidence value based on the magnitude operation; and

determining the acceptability of the correspondence between the first holographic image and the second holographic image based upon the confidence value.

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18. The method of Claim 17 further comprising providing the first holographic image and the second holographic image using a digital holographic imaging system.

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19. The method of Claim 17 wherein calculating the confidence value utilizes at least one identified coherent peak.

- 5 20. The method of Claim 17 wherein calculating the confidence value further comprises determining the difference in strength between a first coherent peak and a second peak.

21. A method for registering holographic images comprising:

providing a first holographic image and a second corresponding holographic image;

5 separately transforming the first holographic image and the second holographic image using a Fourier transform;

separately performing a sideband extraction operation on the resulting first holographic image and
10 the second holographic image;

separately filtering the resulting the first holographic image and the second holographic image using a bandpass filter;

calculating the conjugate product of the resulting
15 first holographic image and the second holographic image;

transforming the conjugate product using an inverse Fourier transform;

performing a magnitude operation on the resulting transformed conjugate product; and

20 performing an integer translation and subpixel modeling operation on the resulting magnitude image.

22. The method of Claim 21 further comprising providing the first holographic image and the second
25 holographic image using a digital holographic imaging system.

23. A method for registering a test holographic image and a reference holographic image in a digital holographic imaging system comprising:

- providing a test sideband from the test image and a
5 reference sideband from the reference image;
- separately filtering the test sideband and the reference sideband using a bandpass filter;
- calculating the conjugate product of the resulting test sideband and reference sideband;
- 10 transforming the conjugate product using an inverse Fourier transform;
- performing a magnitude operation on the resulting transformed conjugate product; and
- performing an integer translation and subpixel
15 modeling operation on the resulting magnitude image.

24. The method of Claim 23 further comprising providing the test holographic image and the reference holographic image using a digital holographic imaging
20 system.

25. A method for comparing corresponding
holographic images comprising:
obtaining a first holographic image;
obtaining a second holographic image corresponding
5 to the first holographic image;
comparing the first holographic image and the second
holographic image and obtaining a first difference image
description;
obtaining a third holographic image corresponding to
10 the second holographic image;
comparing the second holographic image and the third
holographic image and obtaining a second difference image
description; and
comparing the first difference image and the second
15 difference image description.

26. The method of Claim 25 further comprising
comparing the first holographic image, the second
holographic image and the third holographic image in the
20 frequency domain.

27. The method of Claim 25 further comprising
comparing the first holographic image, the second
holographic image and the third holographic image in the
25 spatial domain.

28. A method for generating a difference between a first complex image and a second corresponding complex image comprising:

converting the first complex image and the second
5 complex image to an amplitude representation; and
computing the magnitude of the difference between the resulting amplitude representations.

29. A method for generating a phase difference between a first complex images and a corresponding second complex image comprising:

converting the first complex image and the second
5 complex image to a first phase image and a second phase image; and

computing the effective phase difference between the first phase image and the second phase image.

30. A method for generating a difference between first complex image and a second corresponding complex image comprising:

- 5 subtracting the first complex image and the second complex image in the complex domain; and
- computing the amplitude of the resulting complex difference.

31. A method for determining common differences between difference images in a digital holographic imaging system comprising:

- thresholding a first difference image and a second
- 5 difference image; and
- shifting one of the thresholded images by a selected
- amount such that the common differences of the both
- difference images are represented by a logical AND of the
- shifted thresholded image and the unshifted thresholded
- 10 difference image.

32. A method for determining common differences
between difference images in a digital holographic
imaging system comprising:

shifting one of the difference images by a selected
5 amount;
thresholding the shifted difference image; and
computing the common differences by performing a
logical-AND of the shifted unthresholded image and the
shifted thresholded image.

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33. A method for determining common differences
between two corresponding difference images in a digital
holographic imaging system comprising:

shifting the first difference image by a selected
5 amount;
combining the shifted image with the second image;
and
thresholding the combined image.